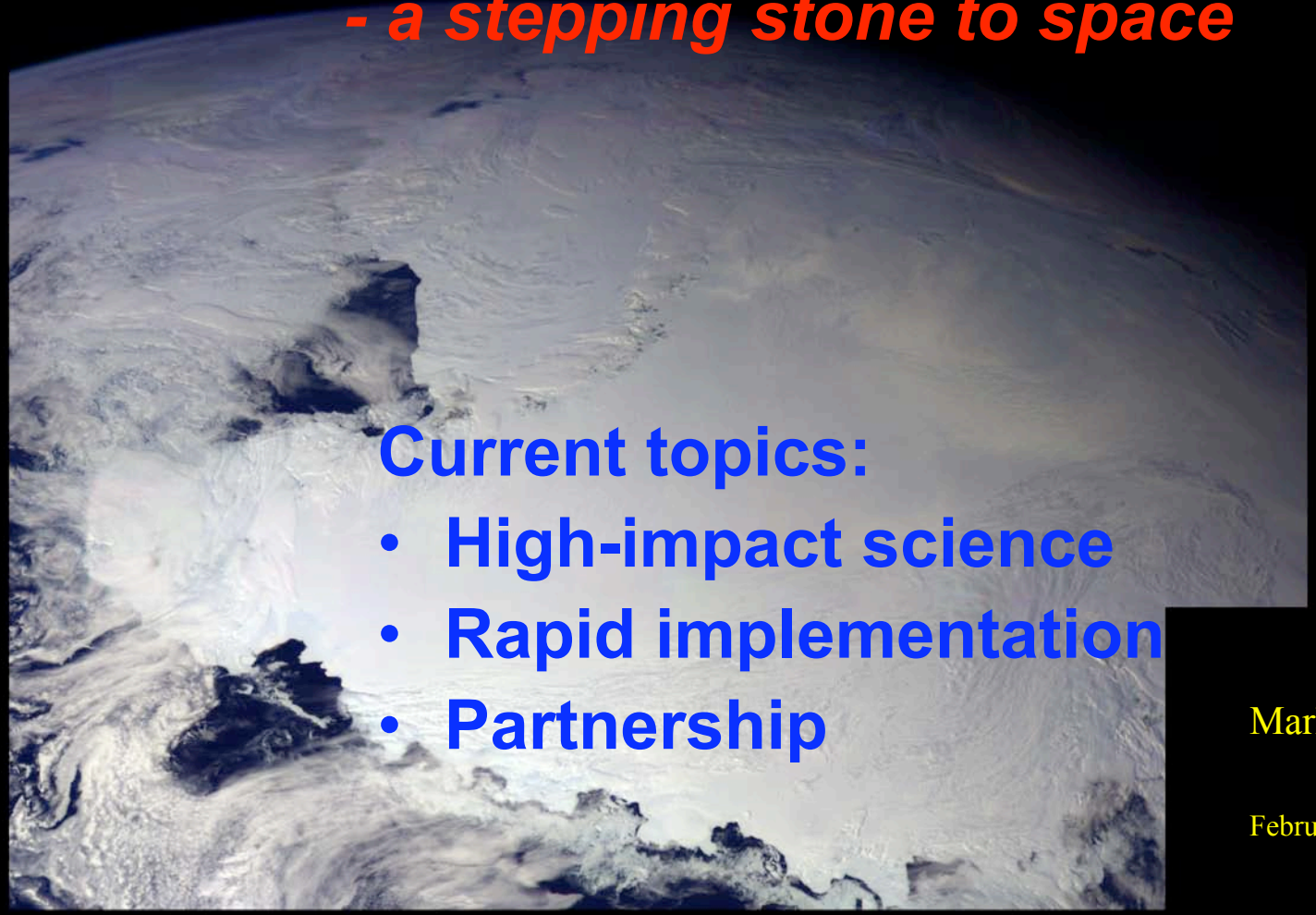
Antarctic Interferometry Potential

- unique discovery space science
- a stepping stone to space



Current topics:

- **High-impact science**
- **Rapid implementation**
- **Partnership**

Mark Swain

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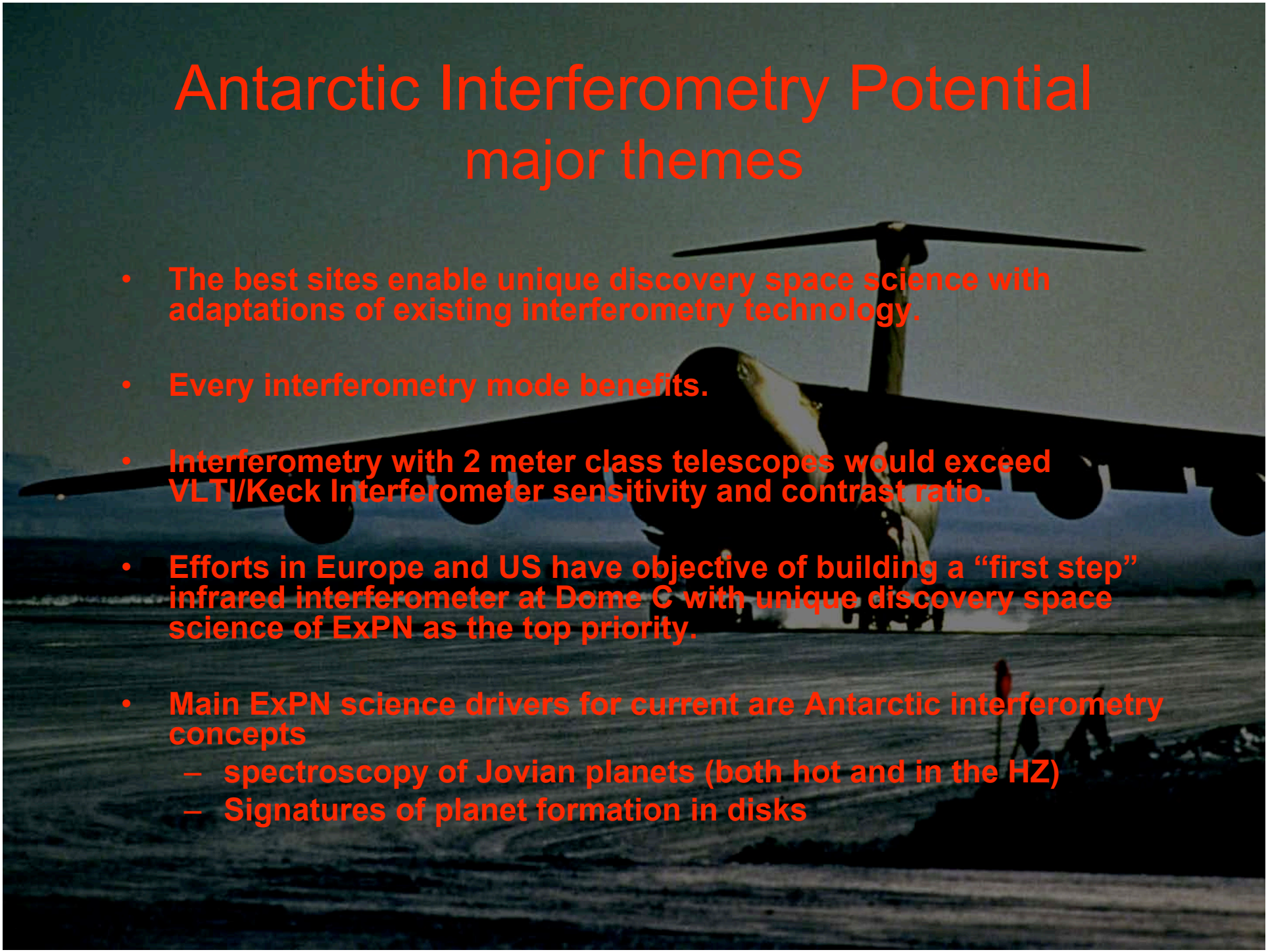


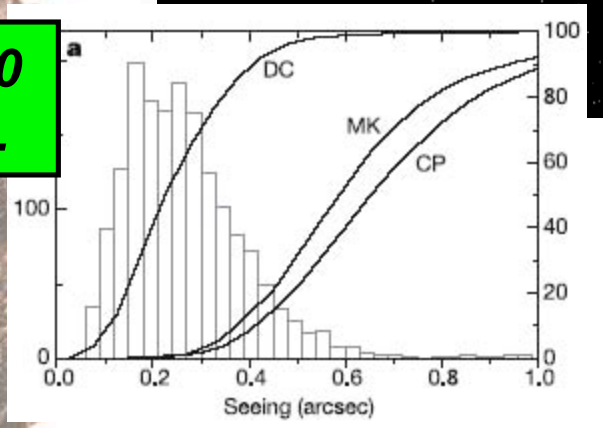
Antarctic Interferometry Potential major themes

- The best sites enable unique discovery space science with adaptations of existing interferometry technology.
- Every interferometry mode benefits.
- Interferometry with 2 meter class telescopes would exceed VLTI/Keck Interferometer sensitivity and contrast ratio.
- Efforts in Europe and US have objective of building a “first step” infrared interferometer at Dome C with unique discovery space science of ExPN as the top priority.
- Main ExPN science drivers for current are Antarctic interferometry concepts
  - spectroscopy of Jovian planets (both hot and in the HZ)
  - Signatures of planet formation in disks

Dome C Antarctica:
•The best know atmosphere for astronomy
•A stepping stone to space

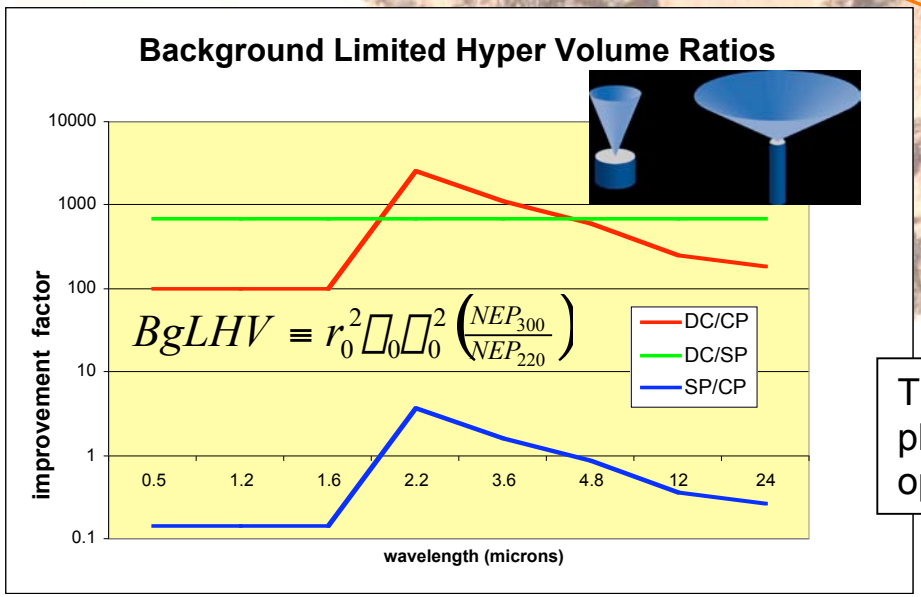
Concordia Station

Dome C atmosphere 100 to 3000 times better than Cerro Paranal.



Night time seeing measurements from Dome C (DC) compared to Mauna Kea (MK) and Cerro Paranal (CP) .
(Nature, 2004, 431, 278)

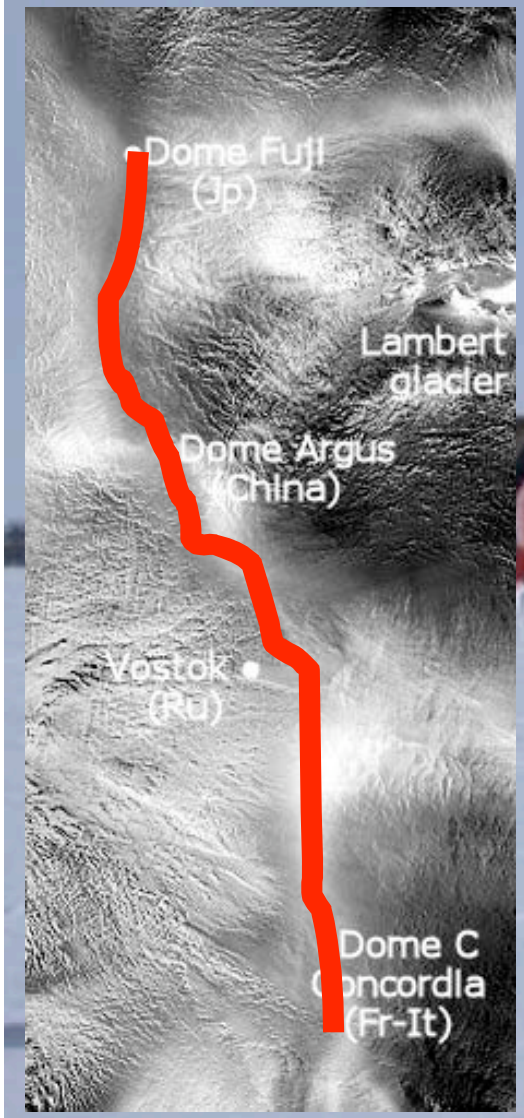
Dome C



The *BgLHV* is a sensitivity weighted merit figure for phase coherent instruments (such as adaptive optics systems and interferometers).

Data in *BgLHV* plot from Nature paper.

Dome C seeing not unique



- Antarctic free atmosphere seeing ~0.2 arcsec.
- Best locations allow instrument placement above primary boundary layer.

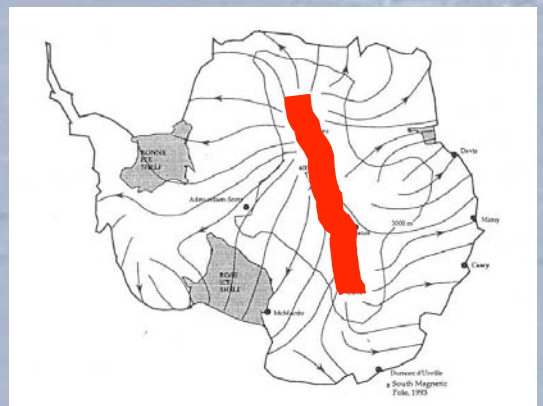


Fig. 8. Contour map of surface wind speeds over Antarctica, from Dopita 1993, based on results of Schwerdtfeger 1984

Dome C – offers immediate infrastructure.

Rapid deployment of proven interferometer technology

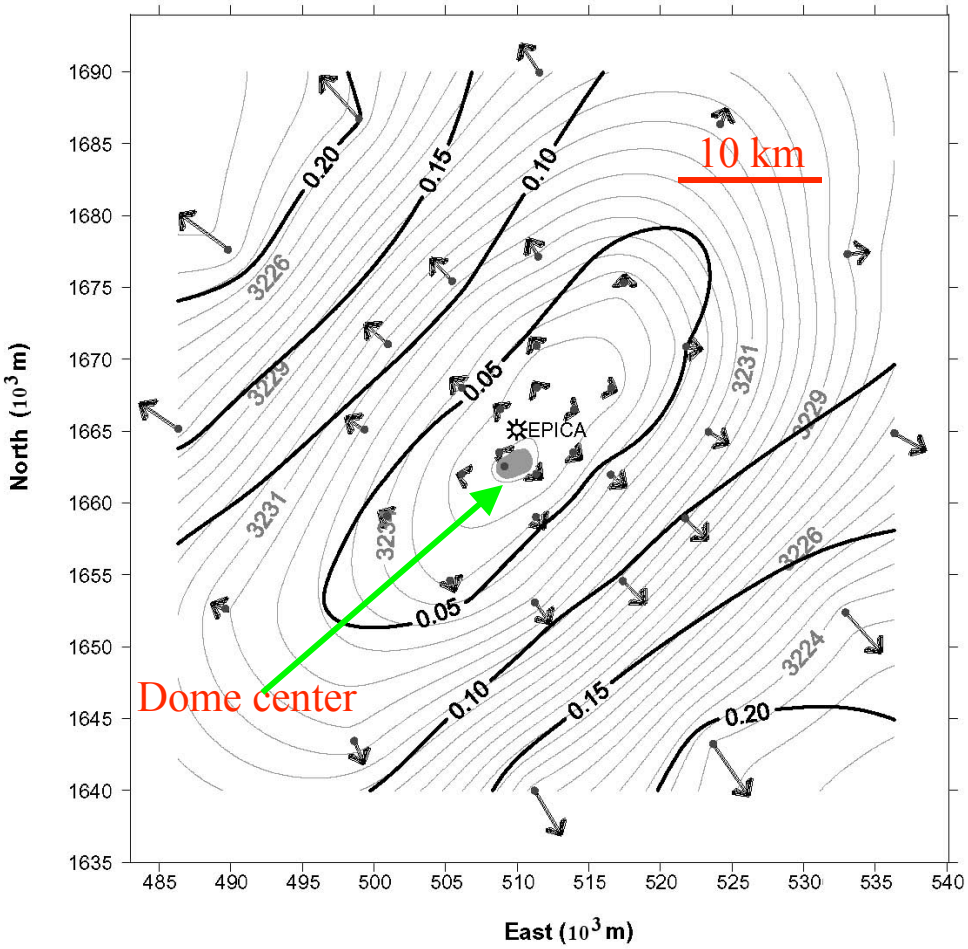
- Method: package instrument in containers using adaptations of existing (KI and VLTI) interferometer technology.
- Each container provides isolation function for transport and alignment function for installation.
- Deployment and full up sky demonstration of containerized interferometer in Northern Hemisphere.
- Ship interferometer to Dome C with no disassembly below the container level.
- Instrument assembly at Dome C consists of installing/aligning modules.

Containerized interferometer packaging

Ice motion: a manageable challenge

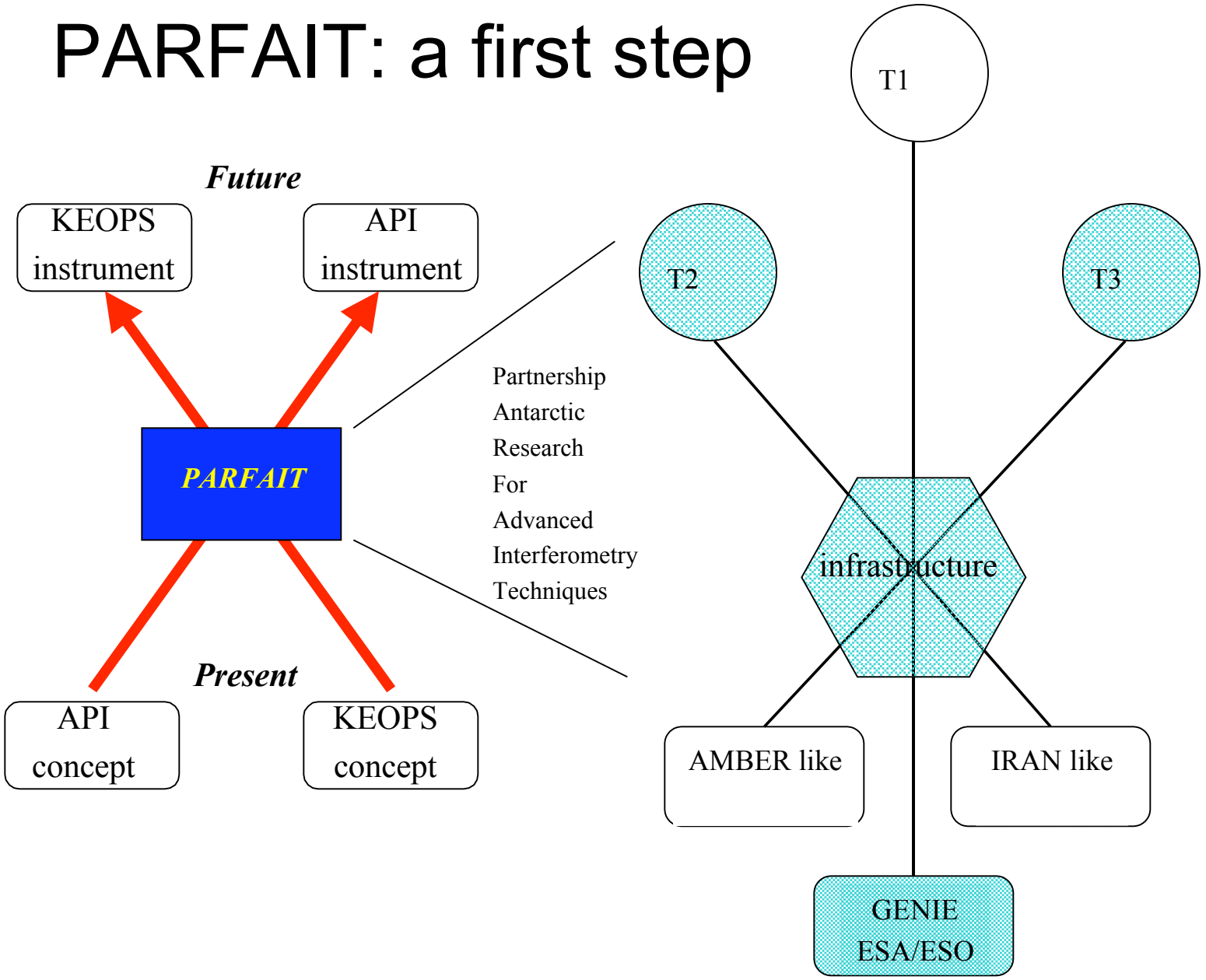
- Flow direction controlled by local slope
- Ice velocity increases with distance from Dome center
- V = 2 mm/yr on Dome
- _V = 1cm/km/yr
- **~0.1 um/hr/100m baseline change**
  - **regular baseline model updates**
- **~1cm relative motions for array elements - manageable**
- **Potential engineering challenge for delay lines**
  - **possible solution is OHANA style multi-pass approach**

Ice motion in the Dome C area (m/yr)



Vittuari et al. 2004, in press

PARFAIT: a first step



What is the future of Habitable Zone Exoplanet Science?